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Designing Successful K-16 STEM Partnerships

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Pop Quiz:

- How many of you are elementary and middle school teachers? High school teachers and AP teachers?
- School or district education specialists?
- Higher education faculty or administrators?



Presentation Overview

- National and State Context
- K-16 Learning Communities
- Project FOCUS
- Your Questions and Comments



The National STEM Challenge

President's Council of Advisors on Science and Technology

“Economic projections point to a need for approximately **one million** more STEM professionals than the U.S. will produce at the current rate over the next decade if the country is to maintain its historical preeminence in science and technology.”



Complete College Georgia

Georgia's Higher Education Completion Plan 2012

- Purpose: To improve college readiness and access
- Universities will continue to partner with the Georgia Department of Education to increase the number of college-ready students graduating from high school

Specifically for STEM:

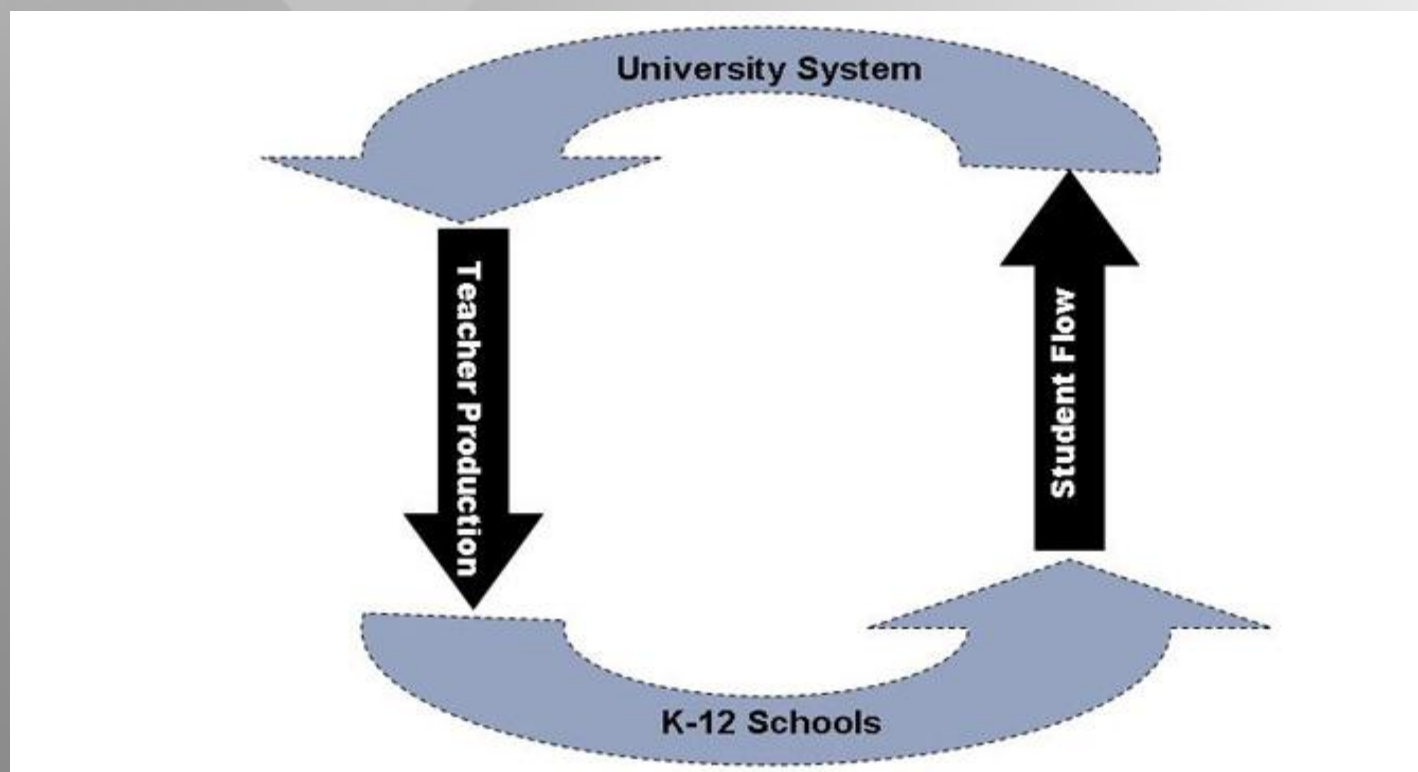
- To improve the completion rate in STEM introductory undergraduate courses to increase the likelihood of college graduation



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The Student/Teacher Pipeline





University System of Georgia's STEM Initiative

- Provides **funding** and leadership for STEM related activities in 8 institutions
- Focuses on improving teaching and learning in STEM disciplines
- A variety of ways for faculty to participate



Board of Regents' Policy #8.3.15. Enhancing Teaching and Learning in K-12 Schools and USG Institutions

- Universities will support faculty who participate significantly and document efforts to:
 - Improve their own teaching so as to model effective teaching practices
 - Contribute scholarship that promotes and improves student learning and achievement in the schools and university
 - **Collaborate with public schools to strengthen teacher quality and to increase student learning**

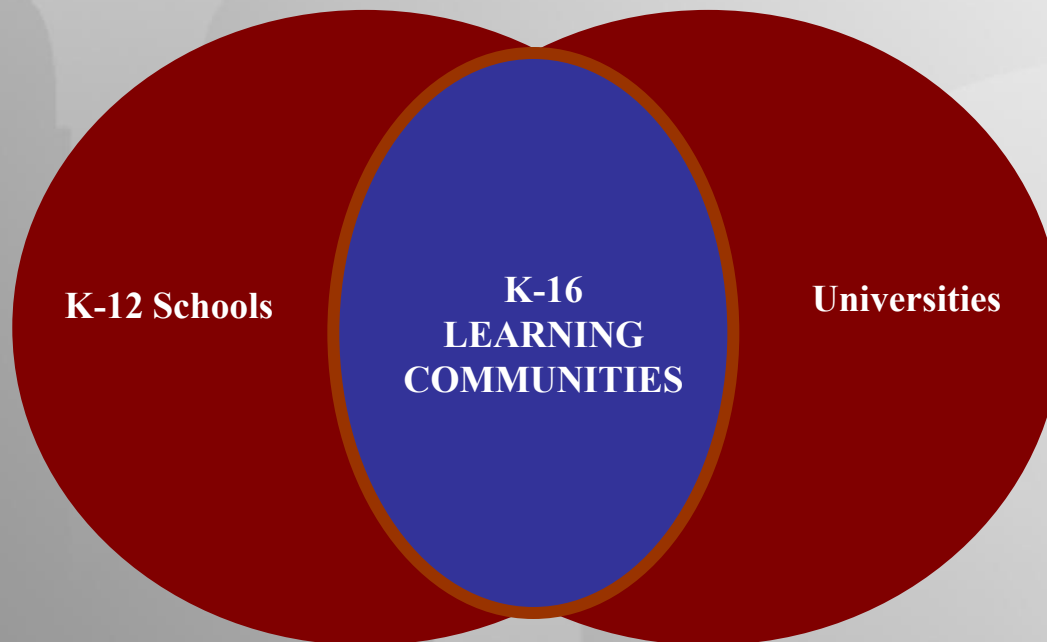


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Learning Communities





What is a Learning Community?

- A **Learning Community** is a group of educators who work collaboratively over time for the purpose of learning how to improve their own instruction and increase student learning.





STEM Learning Communities

- UGA Faculty and K-12 Educators Work Collaboratively
 - Meet on a regular basis
 - Discuss, share, and implement ways to improve teaching and student learning
 - 8-10 funded each year





Northeast Georgia A.P. Calculus Learning Community

- Focus: Improving Student Achievement on the College Board Exam
- Membership:
 - Teachers teaching A.P. Calculus from 11 school districts
 - Higher education faculty from UGA Mathematics Department
 - Members rotate roles



Northeast Georgia A.P. Calculus Learning Community

- Logistics: Meets monthly on a weekday evening at a central location – Chamber of Commerce
- Activities:
 - Team building
 - Share lesson plans
 - Discuss areas of weakness
 - Increase content and pedagogical knowledge
 - Increase knowledge of structure and grading of A.P. exam
 - Exchange ideas and resources electronically between meetings



A.P. Calculus Learning Community

The Mean of A.P. Calculus Students' Scores of
Teachers in A.P. Calculus LC

State of LC	School Year	AP Calc LC	State	Nation
Prior to LC	2004-05	2.00	2.80	2.94
Began 12/05	2005-06	2.63	2.85	3.02
Second Year	2006-07	3.73	2.82	2.92
Third Year	2007-08	3.35	2.70	3.01



Northeast Georgia A.P. Calculus Learning Community

“I’ve taught for more than 23 years and I’ve been teaching AP Calculus for the last two years, and I don’t think I could have made it without the learning community.”

“The learning community provides me a chance to hone my skills, and I really enjoy the camaraderie; for the most part, I haven’t had that. The knowledge of this group is powerful.”





Northeast Georgia Chemistry Learning Community

- Focus: Designing instruction to help students understand basic chemical concepts
- Membership:
 - UGA Chemistry faculty
 - Graduate assistants
 - High school AP and pre-AP chemistry teachers from 5 school districts



Northeast Georgia Chemistry Learning Community

- Logistics: Meets once per month at UGA Chemistry Building
- Activities:
 - Discuss critical issues in the teaching and learning of chemistry
 - Share successes, challenges, content knowledge, and resources
 - Attend AP Institute together



- The research of one Chemistry professor led to many discussions of the most troublesome chemistry concepts for UGA students and how to help students improve their performance on:
 - Understanding the structure of ionic compounds
 - Unit conversion problems, esp. volume to area or height
 - Molecular polarity
 - Intermolecular forces
 - Understanding quantum numbers
 - Distinguishing the terms strong, weak, concentrated, and dilute
 - Inorganic nomenclature



Observed Impact on IHE

- Applying new strategies to IHE courses
- Appreciation for the lives of K-12 teachers
- Participation in the Scholarship of Teaching and Learning
- Familiarity with K-12 curriculum
- Involvement in developing K-12 curriculum and in-service courses





Impact on Higher Education Faculty:

“I was struck by teachers’ classroom management strategies. I’ve adopted several for my own classes.”

“Working with K-12 teachers...it has us observing and thinking about teaching methods. More campus discussions are occurring about pedagogy.”

“In this collaboration it allows both Higher Ed and K-12 faculty see how we are both parts of the same puzzle...”



Observed Impact on K-12 Teachers

- Indicators of effectiveness of learning communities
 - Increased AP Exam scores
- Teachers report that they participate because:
 - Feel less isolated
 - Enjoy the company of the other LC members
 - Gain something useful for their teaching at each meeting



So, you want to start a STEM learning community...

- Organize the community
 - Contact the appropriate department at your closest college or university, and/or
 - Send an invitation letter to other teachers in your area
 - Communicate with members and set the first meeting
 - Set the agenda for the first meeting which should include developing team norms, determining meeting schedule, and setting goals for the community
- Set goals for your work
 - Use test score data to determine needs
 - Survey each member for challenges and issues
- Go in with your eyes open – it's hard work
- Celebrate your successes



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The University
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Fostering Our Community's Understanding of Science **Project FOCUS**





Project FOCUS

- Service-learning course
- STEM undergraduates teach inquiry-based lessons in K-5 classrooms
- This year piloting FOCUS in selected middle schools
- Lesson plans and other information at:
<http://www.caes.uga.edu/academics/focus/>



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Project FOCUS

This year:

- 136 undergraduate students enrolled
- 8 elementary and 2 middle schools served





The UGA Office of STEM Education

Provide Campus-Wide Leadership for STEM Activities

- Clearinghouse for STEM information
- Facilitate partnerships with local schools
- Seek funding: NSF STEP & S-STEM, CIRTL
- Website: www.ose.uga.edu
- Contacts:
 - Chuck Kutal— ckutal@uga.edu
 - Nancy Vandergrift— vandergr@uga.edu



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